DRILL-DUST COLLECTORS APPROVED BY THE BUREAU OF MINES AS OF JANUARY 31, 1956

BY C. W. OWINGS, F. G. ANDERSON, J. P. HARMON, L. JOHNSON, AND L. B. BERGER

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Thos. H. Miller, Acting Director

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L. Johnson, [4] and L. B. Berger [5]

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INTRODUCTION

One phase of Bureau of Mines health and safety work is promotion of the use of safe and effective dust-collecting devices in connection with rock drilling in coal mines. To insure that adequate equipment of this type is available to the coal-mining industry, the Bureau of Mines conducts investigations and issues approvals for dust-collecting equipment that meets the requirements of a schedule established for testing dust collectors intended for use in connection with roof drilling for roof bolting and for other rock drilling. 6/ Performance tests are conducted under the provisions of this schedule by engineers of the Branch of Health Research.

This circular describes briefly the requirements and procedure for approval and lists drill-dust collectors that have been granted approval as of January 31, 1956. The addresses of manufacturers of approved devices are listed alphabetically at the end of this circular.

APPROVAL PROCEDURE

Application for approval of dust collectors is voluntary on the part of manufacturers of dust-collecting equipment. Safe operation of dust collectors underground involves consideration of (1) prevention of dissemination of harmful or objectionable concentrations of dust into the surrounding mine atmosphere; (2) protection from hazard of exposed moving mechanical parts; and (3) protection from shock, explosion, and fire hazards by electrical equipment. Dust collectors for use in coal mines are considered permissible only when proved by test and inspection to be adequate in these respects.

The equipment must be fully developed and of the design and materials suitable for a finished, marketable product. Detailed drawings and specifications must be submitted with the request for approval, so that, if a piece of equipment is approved, the Bureau of Mines may be sure that units marketed subsequently are identical in all respects to the equipment for which approval was granted.

6/ Bureau of Mines, Procedure for Testing Dust Collectors for Permissibility for Use in Connection With Rock Drilling in Coal Mines: Schedule 25A, Apr. 1955, 7 pp.

(Code of Federal Regulations reference: 30 CFR, Chapter 1, Subchapter E, Part 33)

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Only a complete dust-collecting unit will be tested. If a unit is combined integrally with a piece of drilling equipment, approval of the combination unit must be requested.

The schedule provides that dust collectors may be approved for use with either percussion or rotary drills or both when drilling is done under any one or any combination of the following conditions: (1) Roof drilling vertically, (2) roof drilling at angles to the vertical, (3) roof drilling through holes in steel shapes, (4) horizontally, and (5) downward.

TEST EQUIPMENT

Tests with percussion drills are conducted for roof drilling with a stoper drill having a piston diameter of 2-7/8 inches, for down drilling with a sinker-type drill having a piston diameter of 2-1/2 inches, and for horizontal drilling with the sinker-type drill supported mechanically. Cross-type bits with hard inserts are used, 1-1/4-inch diameter for drilling roof holes and 1-3/4-inch for drilling horizontal and down holes. Hollow, 7/8-inch, hexagonal drill steel is used. The drills are operated by compressed air at 85 to 95 p. s. i., and compressed air may be admitted through the hollow drill steel if necessary to clear the hole.

Tests with rotary drills are conducted for roof drilling with a hydraulic rotary tram drill and for horizontal drilling with a post-mounted electric rotary drill. The hydraulic rotary drill has a maximum drill-feed rate of 18 feet per minute, a torque of 100 foot-pounds at 900 revolutions per minute, and a thrust of 7,000 pounds and is powered by a 10-horsepower electric motor. The electric rotary drill has a rated drilling speed of 30 inches per minute and is powered by a 2.25-horse-power electric motor. Hard-tipped rock-drill bits, 1-3/8 inches in outside diameter, and 1-1/4-inch auger-type drill steel are used for roof drilling. Hard-tipped fork-type bits, 2 inches in outside dimension, and 1-3/4-inch auger-type drill steel are used for horizontal drilling.

CONDUCT OF TESTS

Tests are conducted at the Bureau of Mines Experimental coal mine at Bruceton, Pa., or at other locations designated by the Bureau of Mines. Before tests are started, the dust-collecting receptacles and filters are cleaned and put into proper operating condition. The test space is bratticed off from other parts of the mine, the surfaces of the test space are wetted before tests are begun, and no mechanical ventilation is maintained except for air movement induced by workmen and by the equipment being tested. Ten holes are drilled for each position and for each type of drill used, except that when drilling is done through steel shapes and downward 5 holes are drilled vertically upward or downward, respectively, and 5 holes are drilled at an angle. The steel shapes are channels 4 inches across the web, track-tie sections, or other shapes selected so that test conditions conform to actual practice in the coal-mining industry. All holes are drilled 4 feet deep, plus or minus 3 inches,

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are spaced to prevent interference, and generally are plugged to prevent contamination of subsequent tests. "Vertical" holes must be within 10° of vertical, "angle" holes between 30° and 45° from vertical, and "horizontal" holes within 15° of horizontal when drilled in draw slate about 6 feet from the floor.

Dust concentrations are determined by collecting samples of airborne dust with the midget-impinger apparatus in the breathing zone of the drill operator while each hole is drilled. Sampling is continued from beginning to finish of a hole, except when drill steel is being changed. The samples are counted by standard Bureau of Mines light-field microscopic technique. A control sample is collected just before drilling is begun; the dust count of this control sample is deducted from the dust count of each individual sample. Calculation of the average net concentration of dust determined by these test samples is based upon the results of at least 80 percent of the samples taken while 10 holes are drilled under a given condition during each test period.

The dust collector under test may be approved only if the net concentration of airborne dust resulting from the escape of dust from the collecting unit does not exceed 10 million particles (10 microns or less in size) per cubic foot of air.

GRANTING OF APPROVAL

The results of the tests are considered carefully, and the accuracy of drawings and specifications is checked by comparison with the equipment. If the collector fails to meet any requirements for approval, notification of such failure is sent to the applicant accompanied by details of the failure, with a view to possible remedying of defects. If the collector successfully passes all requirements, the applicant is given written notification, and a photograph of a design of an approval plate is transmitted. The approval plate defines the type of drill with which the dust collector may be used, the direction of drilling for which it is approved, and the assembly of the component parts. Users of permissible equipment should read these plates carefully and become familiar with the conditions of permissibility.

MAINTENANCE OF COLLECTORS

The approval plate indicates that the dust collector can maintain the air free of harmful concentrations of dust if it is used properly and is maintained in the same condition as when tested. The Bureau of Mines has taken extreme care to determine the capability of each unit tested; but if the equipment is altered in any manner, used in a nonpermissible manner, used under conditions not specified on the approval plate, or not maintained according to instructions issued with each collector by the manufacturer, the collector may operate ineffectively, and the workmen may be exposed to harmful concentrations of dust. Common causes of faulty operation through improper maintenance are: (1) Collector head gaskets worn or damaged; (2) filter container not sealed tightly; (3) filter clogged by oil from compressor; (4) filter elements improperly assembled; (5) filter allowed to become clogged with dust; (6) dust containers not emptied when full; and (7) hose connections leaking.

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The same attention should be given a dust collector as any other expensive piece of equipment; in fact, it should receive even greater care, because improper use or inadequate maintenance of the collector may impair the health of workmen.

LIST OF PERMISSIBLE DUST COLLECTORS

Lists of approved dust collectors will be published from time to time as the number increases. Photographs of permissible collectors are included in this circular.

As of January 31, 1956, 38 approvals had been granted for permissible units or combination units. The first approvals were granted August 22, 1952. The permissible dust collectors are listed below according to the type of drilling for which they were approved.

Percussion and Rotary Drilling

1. Bolt Hole Cleaner, drum type. - Approval BM-2501 issued to Mine Safety Appliances Co. August 22, 1952. Approved for use in connection with percussion or rotary rock drilling in coal mines when holes are drilled in the following positions: (1) Upward, (2) through holes in steel shapes, and (3) downward.

2. Bolt Hole Cleaner, box type. - Approval BM-2505 issued to Mine Safety Appliances Co. January 6, 1953. Approved for use in connection with percussion or rotary rock drilling in coal mines when holes are drilled in the following positions: (1) Upward, (2) through holes in steel shapes, and (3) downward.

3. Bolt Hole Cleaner, type J. - Approval BM-2520 issued to Mine Safety Appliances Co. August 9, 1954. Approved for use in connection with percussion or rotary rock drilling in coal mines when holes are drilled in the following positions: (1) Upward, (2) through holes in steel shapes, and (3) downward.

4. Bolt Hole Cleaner, dual type with electric motor. - Approved BM-2524 issued to Mine Safety Appliances Co. March 3, 1955. Approved for use in connection with percussion or rotary rock drilling in coal mines when holes are drilled in the following positions: (1) Upward, (2) through holes in steel shapes, and (3) downward, with 1 drill or 2 drills operating simultaneously.

5. Bolt Hole Cleaner, dual type with air motor. - Approval BM-2525 issued to Mine Safety Appliances Co. March 3, 1955. Approved for use in connection with percussion or rotary rock drilling in coal mines when holes are drilled in the following positions: (1) Upward, (2) through holes in steel shapes, and (3) downward, with 1 drill or 2 drills operating simultaneously.

A typical dust collector for percussion and rotary drilling is shown in figure 1.

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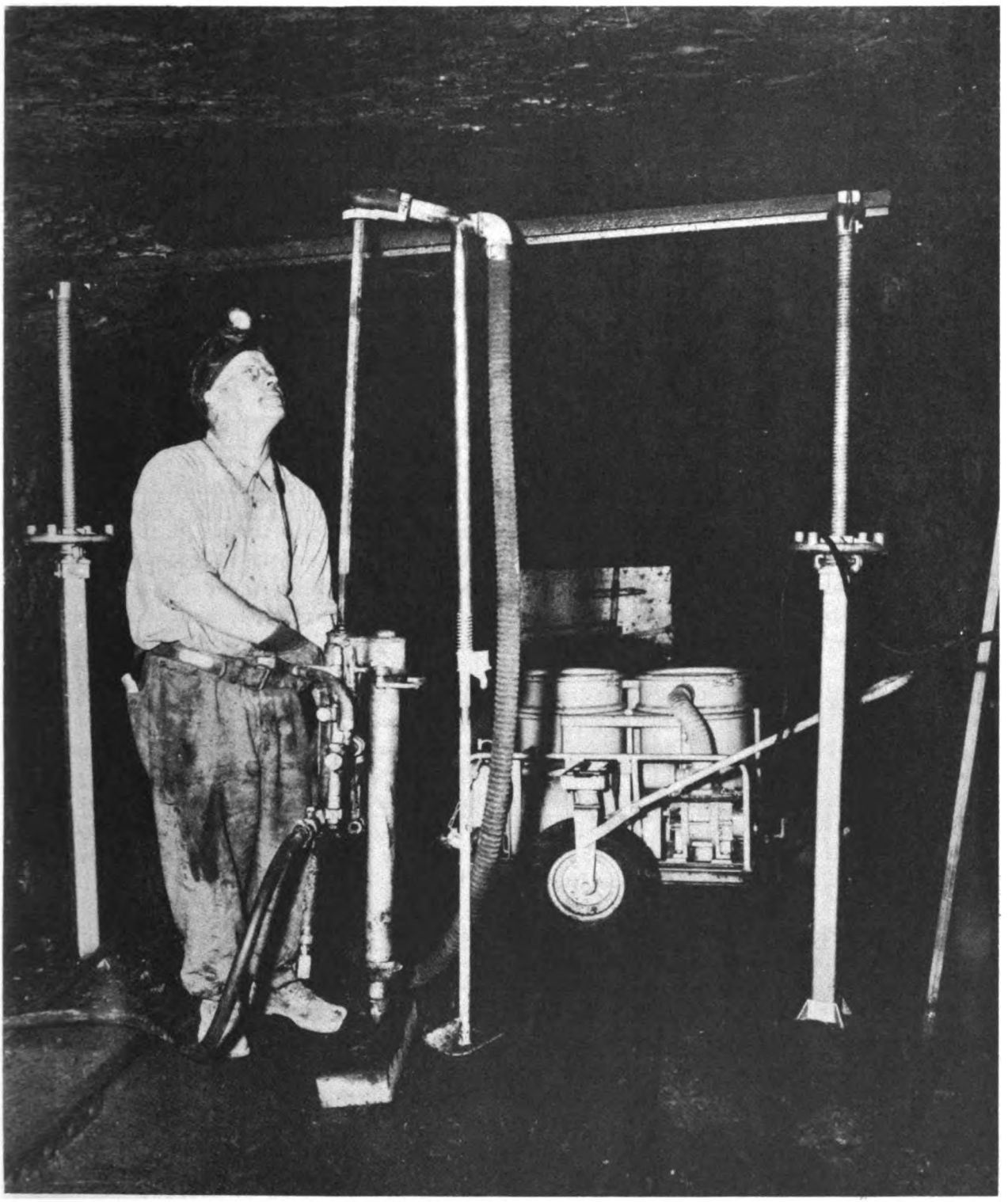

Figure 1. - M. S. A. bolt hole cleaner. BM-2501.

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Percussion Drilling

6. Browning dust collector. - Approval BM-2502 issued to Browning Dust Collector Co. August 22, 1952. Approved for use in connection with percussion rock drilling in coal mines when roof holes are drilled vertically.

7. Model D-3 dust collector. - Approval BM-2503 issued to United Engineers Inc. August 22, 1952; extension of approval November 7, 1952. Approved for use in connection with percussion rock drilling in coal mines when roof holes are drilled vertically and at an angle to the vertical.

8. Model D-4 dust collector. - Approval BM-2504 issued to United Engineers Inc. November 7, 1952. Approved for use in connection with percussion rock drilling in coal mines when roof holes are drilled vertically and at an angle to the vertical.

9. Model SJ70 self-propelled roof-bolting stoper jumbo with integral dust-collecting system. - Approval BM-2506 issued to Westinghouse Air Brake Co. (formerly LeRoi Co.) February 19, 1953. Approved for use in connection with rock drilling in coal mines when roof holes are drilled vertically.

10. Model S-6 dust collector. - Approval BM-2507 issued to United Engineers Inc. March 6, 1953. Approved for use in connection with percussion rock drilling in coal mines when roof holes are drilled vertically and at an angle to the vertical.

11. Browning box-type dust collector. - Approval BM-2513 issued to Browning Dust Collector Co. February 2, 1954. Approved for use in connection with percussion rock drilling in coal mines when roof holes are drilled vertically.

12. Model S11DCS or S11DCT dust-collector stoper with integral dust-collecting system. - Approval BM-2515 issued to Westinghouse Air Brake Co. (formerly LeRoi Co.) April 13, 1954. Approved for roof drilling in coal mines when drilling is done vertically.

13. Holman Shortdryductor rock drill with integral dust-collecting system, powered by an eductor. - Approval BM-2516 issued to Goodman Manufacturing Co. July 15, 1954. Approved for rock drilling in coal mines.

14. Holman Shortdryductor rock drill with integral dust-collecting system, powered by an electric motor. - Approval BM-2517 issued to Goodman Manufacturing Co. July 15, 1954. Approved for rock drilling in coal mines.

15. Holman Dryductor rock drill with integral dust-collecting system, powered by an eductor. - Approval BM-2518 issued to Goodman Manufacturing Co. July 15, 1954. Approved for rock drilling in coal mines when drilling is done vertically upward and horizontally.

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16. Holman Dryductor rock drill with integral dust-collecting system, powered by an electric motor. Approval BM-2519 issued to Goodman Manufacturing Co. July 15, 1954. Approved for roof drilling in coal mines when drilling is done vertically.

17. Browning dust collector designed for attachment to pneumatic percussion drills. - Approval BM-2523 issued to Browning Dust Collector Co. January 3, 1955. Approved for use with Joy Manufacturing Co. model SAE-91 or SAL-37 stoper drills, when roof holes are drilled vertically in coal mines.

18. Model RP-38 Dustless stoper with integral dust-collecting system. - Approval BM-2527 issued to Ingersoll-Rand Co. April 4, 1955. Approved for rock drilling in coal mines.

19. Model S20 Vac-Nu-Matic stoper with integral dust-collecting system. - Approval BM-2531 issued to Westinghouse Air Brake Co. April 28, 1955. Approved for rock drilling in coal mines.

20. Browning tank-type dust collector designed for attachment to pneumatic percussion drills. - Approval BM-2532 issued to Browning Dust Collector Co. April 28, 1955. Approved for use with Joy Manufacturing Co. model SAE-91 or SAL-37 stoper drills or Westinghouse Air Brake Co. model S11S stoper drill, when roof holes are drilled vertically in coal mines.

Typical dust collectors for percussion drilling are shown in figures 2 through 12.

Rotary Drilling

21. No-Power Dust Trap. - Approval BM-2508 issued to No-Power Dust Trap Co. March 17, 1953. Approved for use in connection with rotary rock drilling in coal mines when roof holes are drilled vertically. (not in commercial production at this date.)

22. Tram roof-control drill with integral dust-collecting system. - Approvals BM-2509 (for 250-volt, direct-current drill) and BM-2509A (for 550-volt, direct-current drill) issued to J. H. Fletcher & Co. April 24, 1953. Approved for roof drilling in coal mines in the following positions: (1) Vertically, (2) at an angle, and (3) through holes in steel shapes.

23. Browning dust collector for rotary drilling. - Approval BM-2510 issued to Browning Dust Collector Co. May 5, 1953. Approved for use in connection with rotary rock drilling in coal mines when roof holes are drilled vertically.

24. Model DDA-C2-R1 track-mounted roof-bolting drill with integral dust-collecting system. - Approvals BM-2511 (for 250-volt, direct-current drill) and BM-2511A (for 550-volt, direct-current drill) issued to J. H. Fletcher & Co. June 16, 1953. Approved for roof drilling in coal mines in the following positions: (1) Vertically, (2) at an angle, and (3) through holes in steel shapes.

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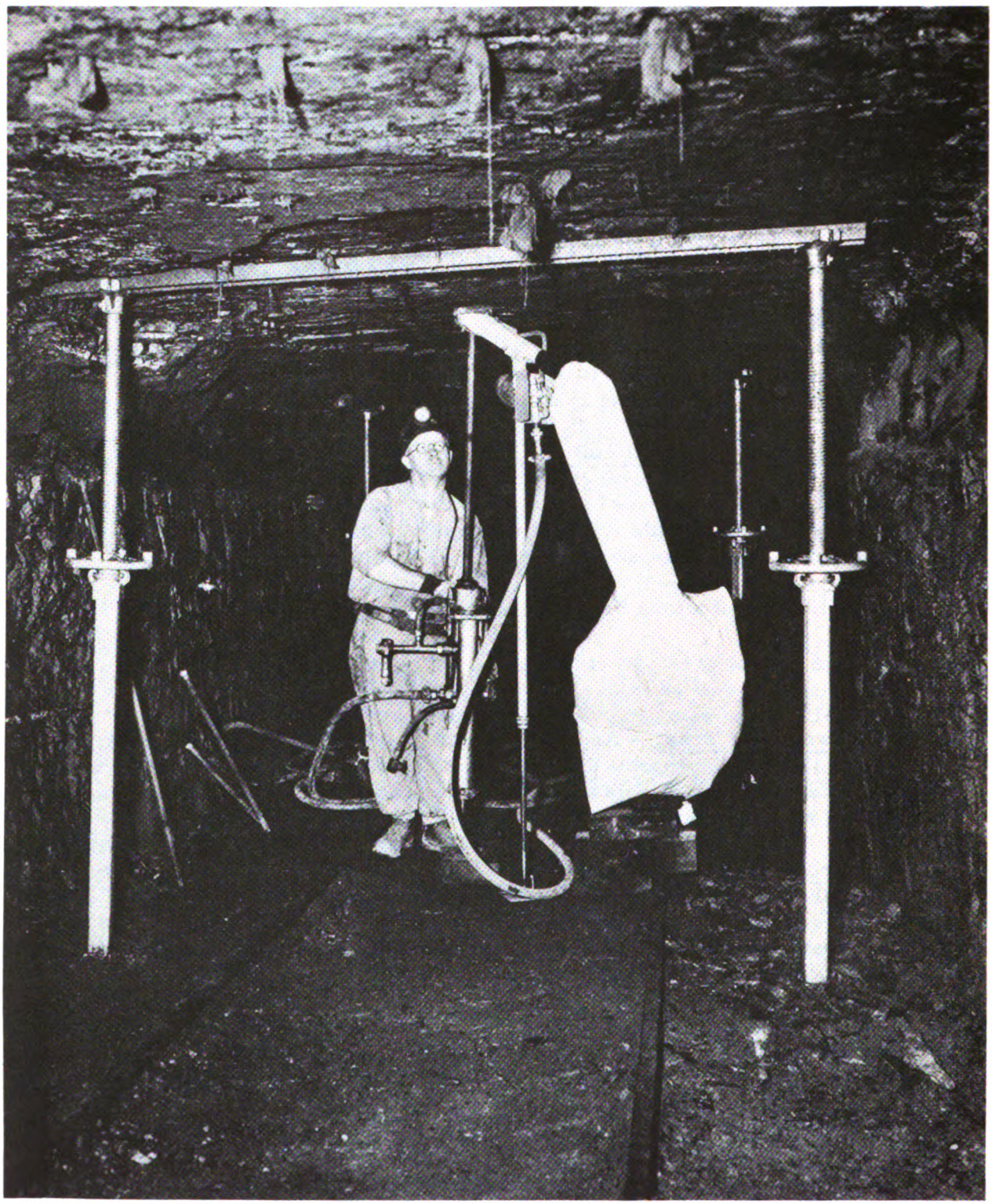

Figure 2. - Browning dust collector. BM-2502.

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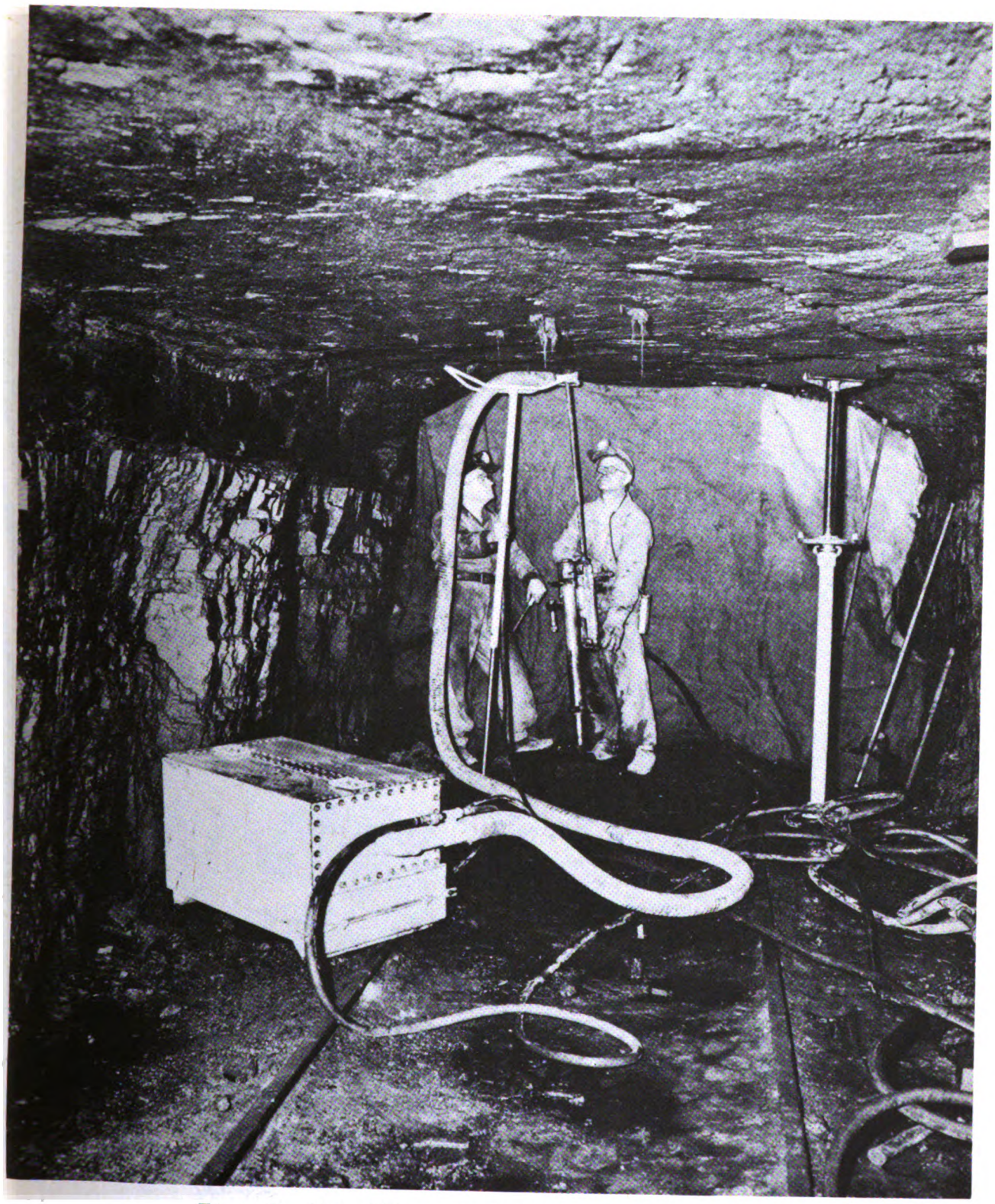

Figure 3. - United Engineers D-4 dust collector. BM-2504.

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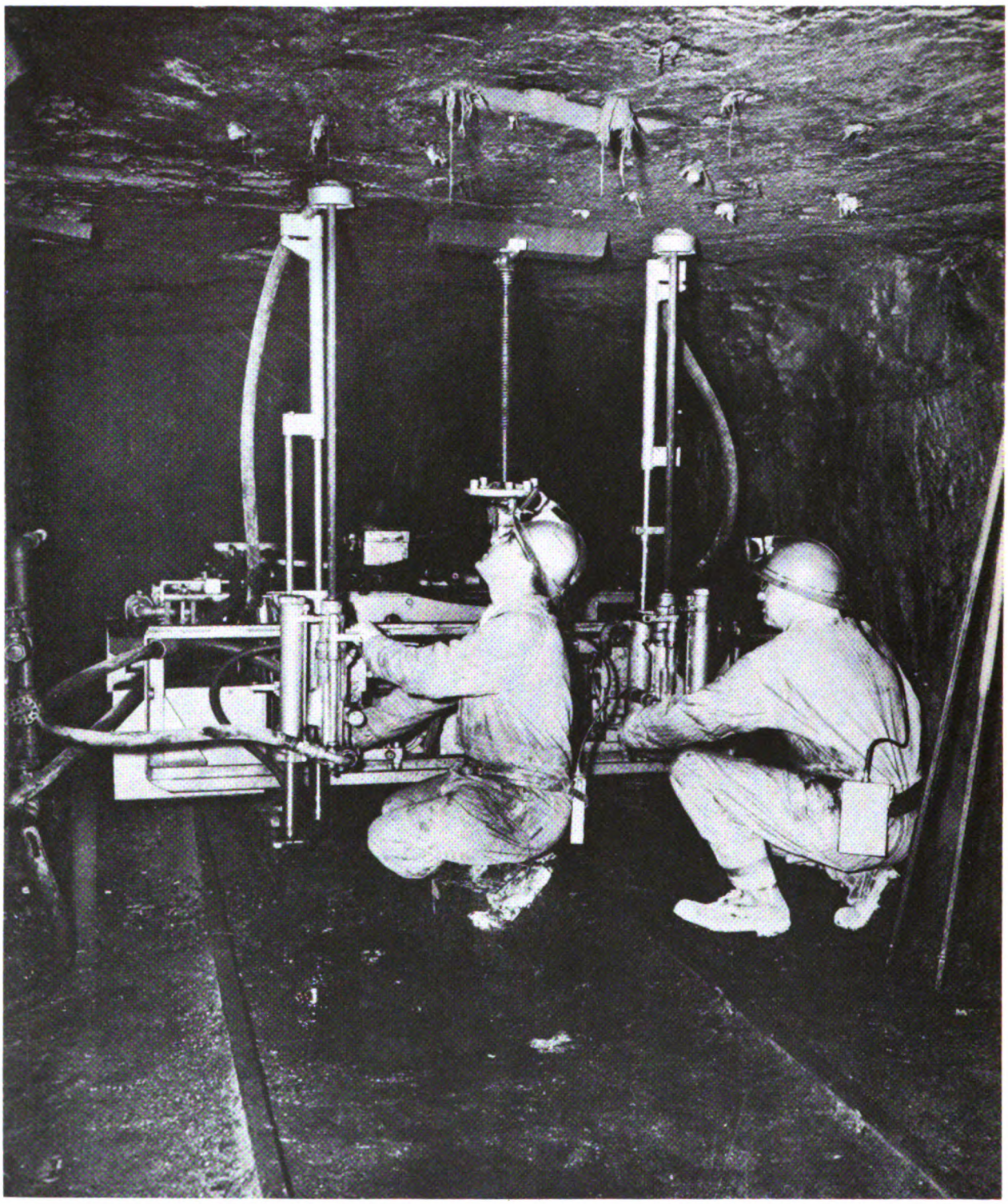

Figure 4. - Westinghouse (LeRoi) stoper jumbo. BM-2506.

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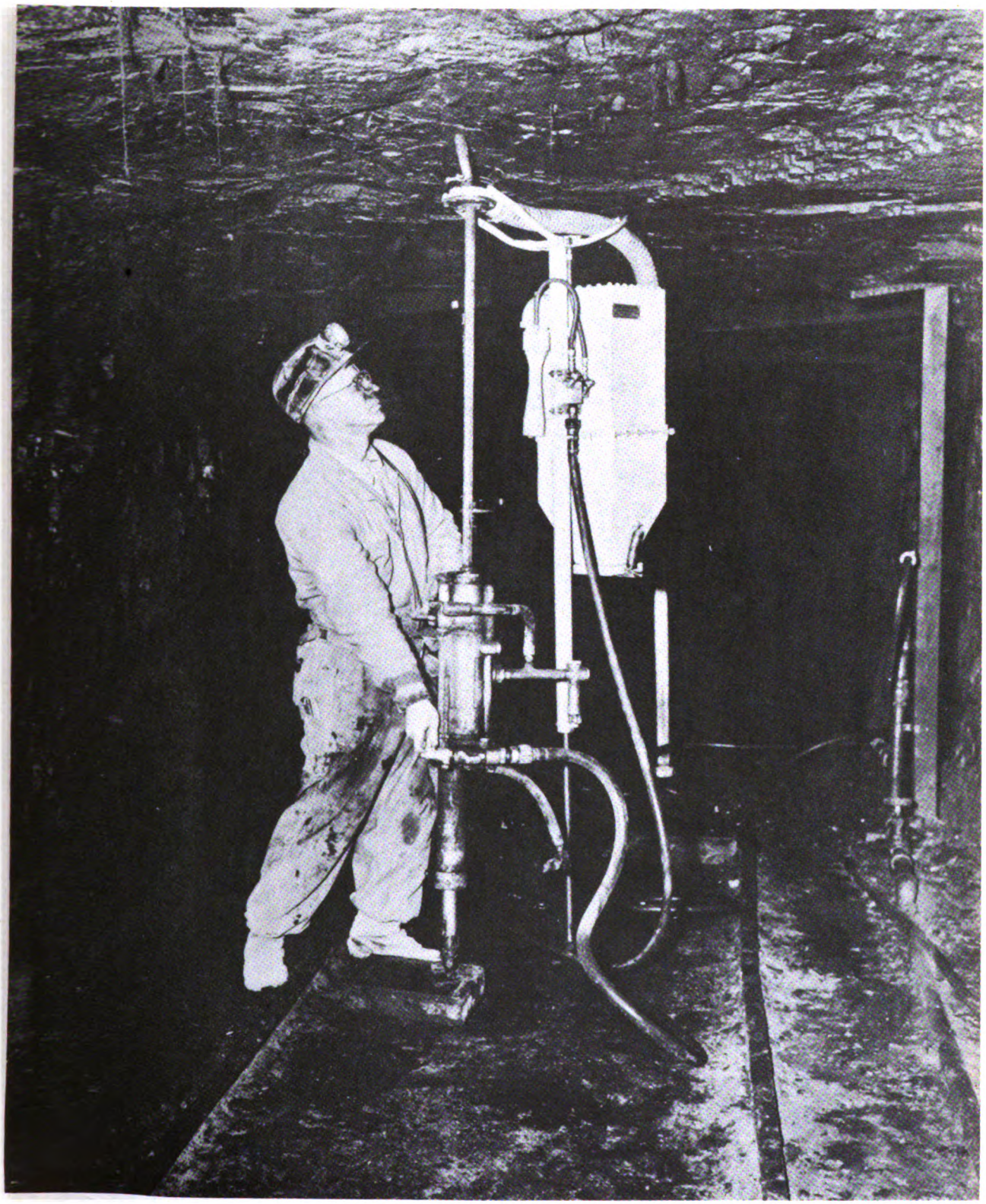

Figure 5. - United Engineers S-6 dust collector. BM-2507.

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Figure 6. - Browning box-type dust collector. BM-2513

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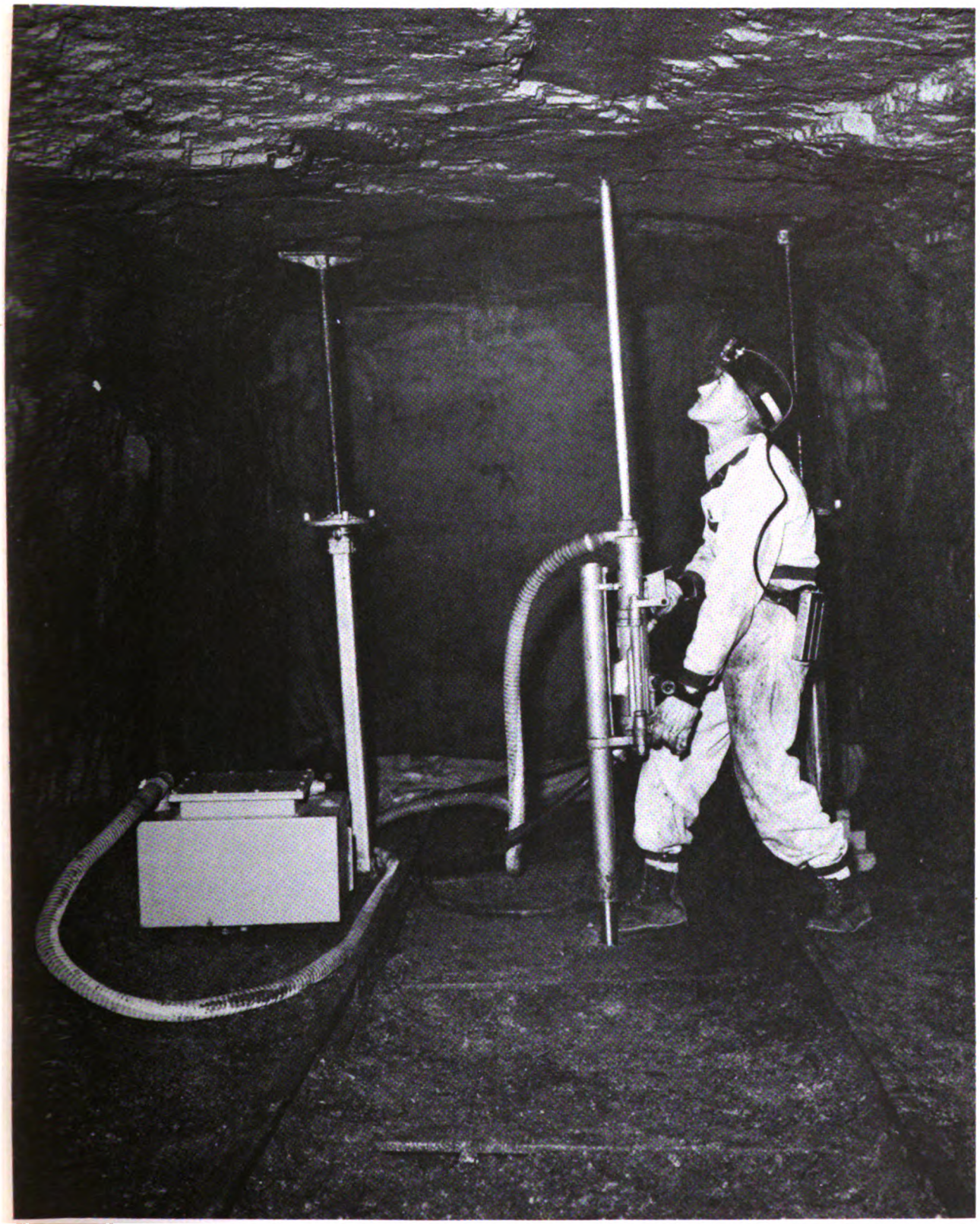

Figure 7. - Westinghouse (LeRoi) dust collector stoper. BM-2515.

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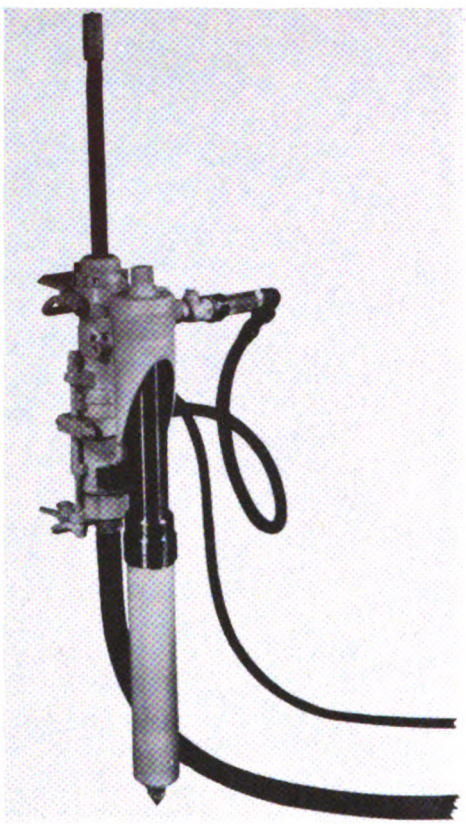

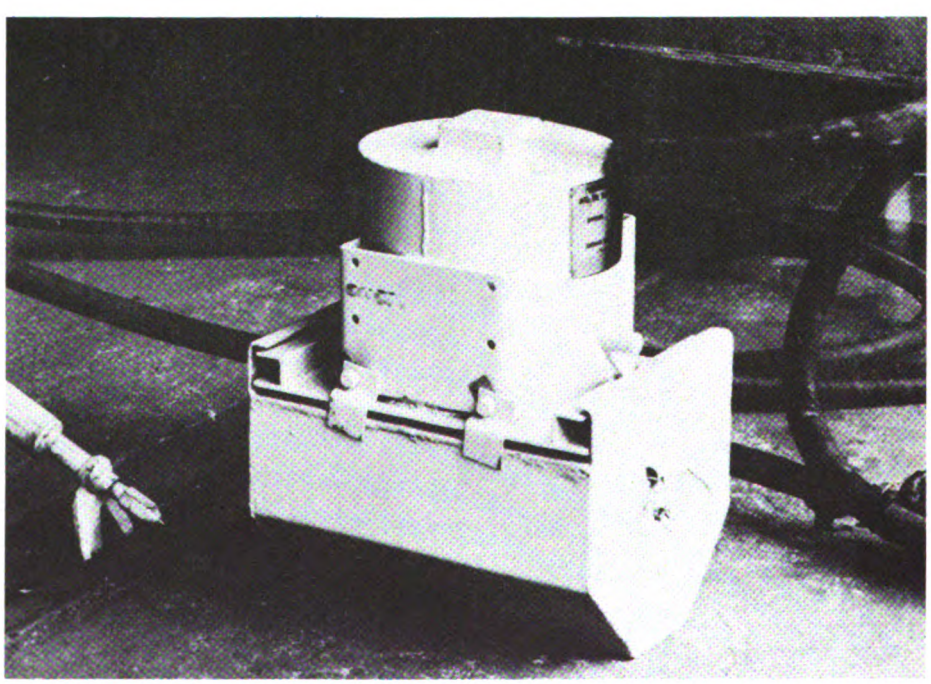

Figure 8. - Holman Dryductor rock drill. BM-2518.

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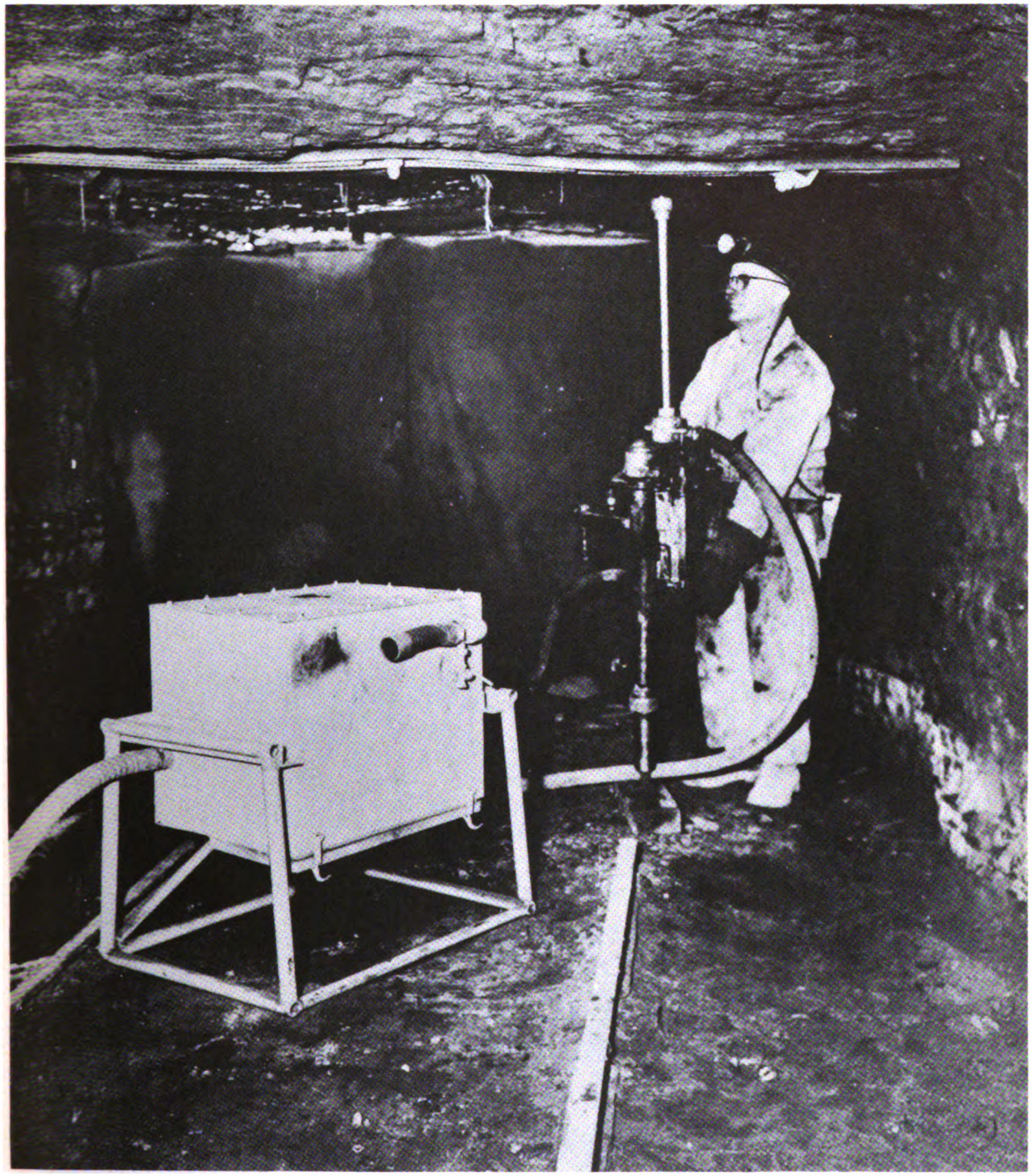

Figure 9. - Browning dust collector. BM-2523.

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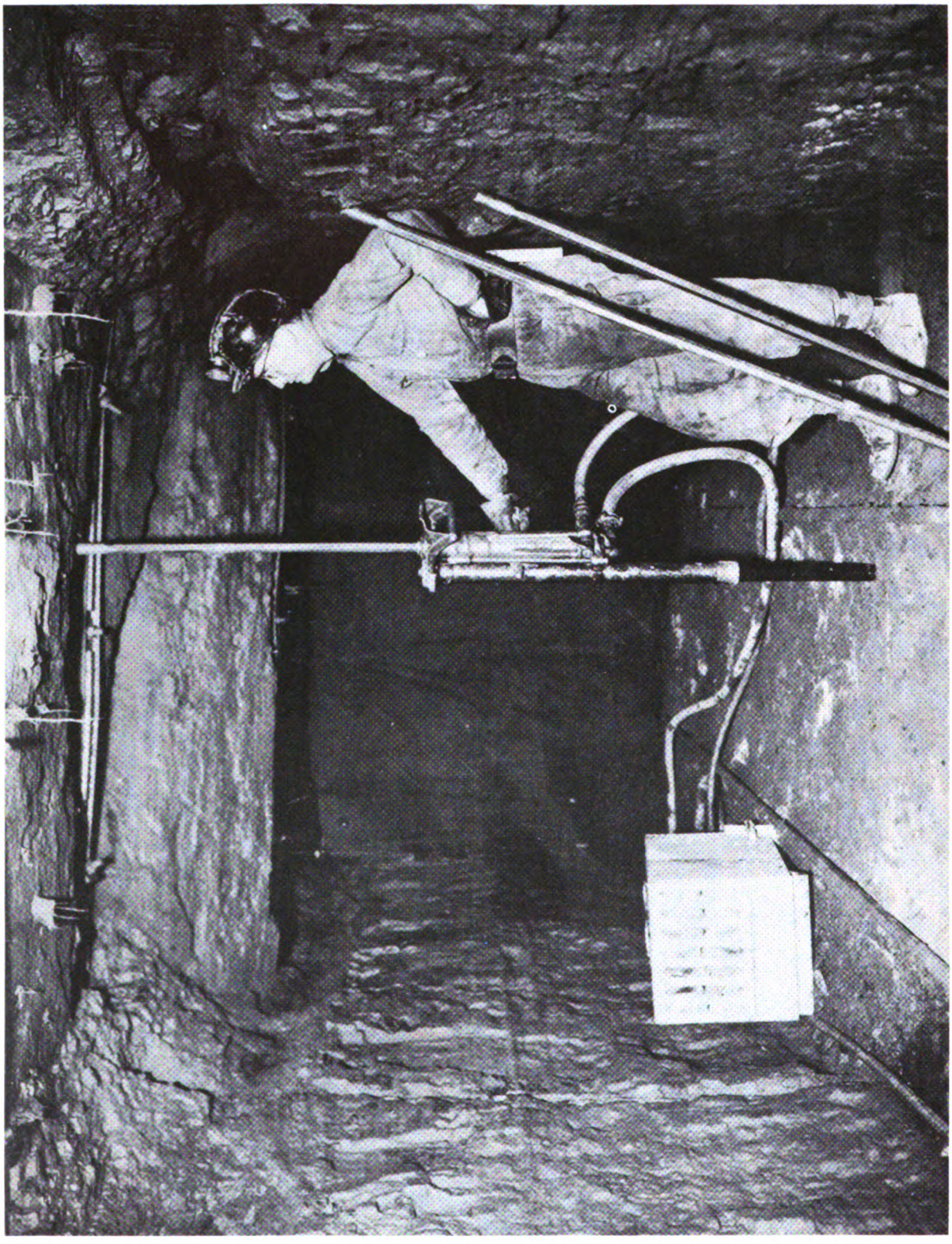

Figure 10. - Ingersoll-Rand dustless stoper. BM-2527.

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Figure 11. - Westinghouse Vac-Nu-Matic stoper. BM-2531.

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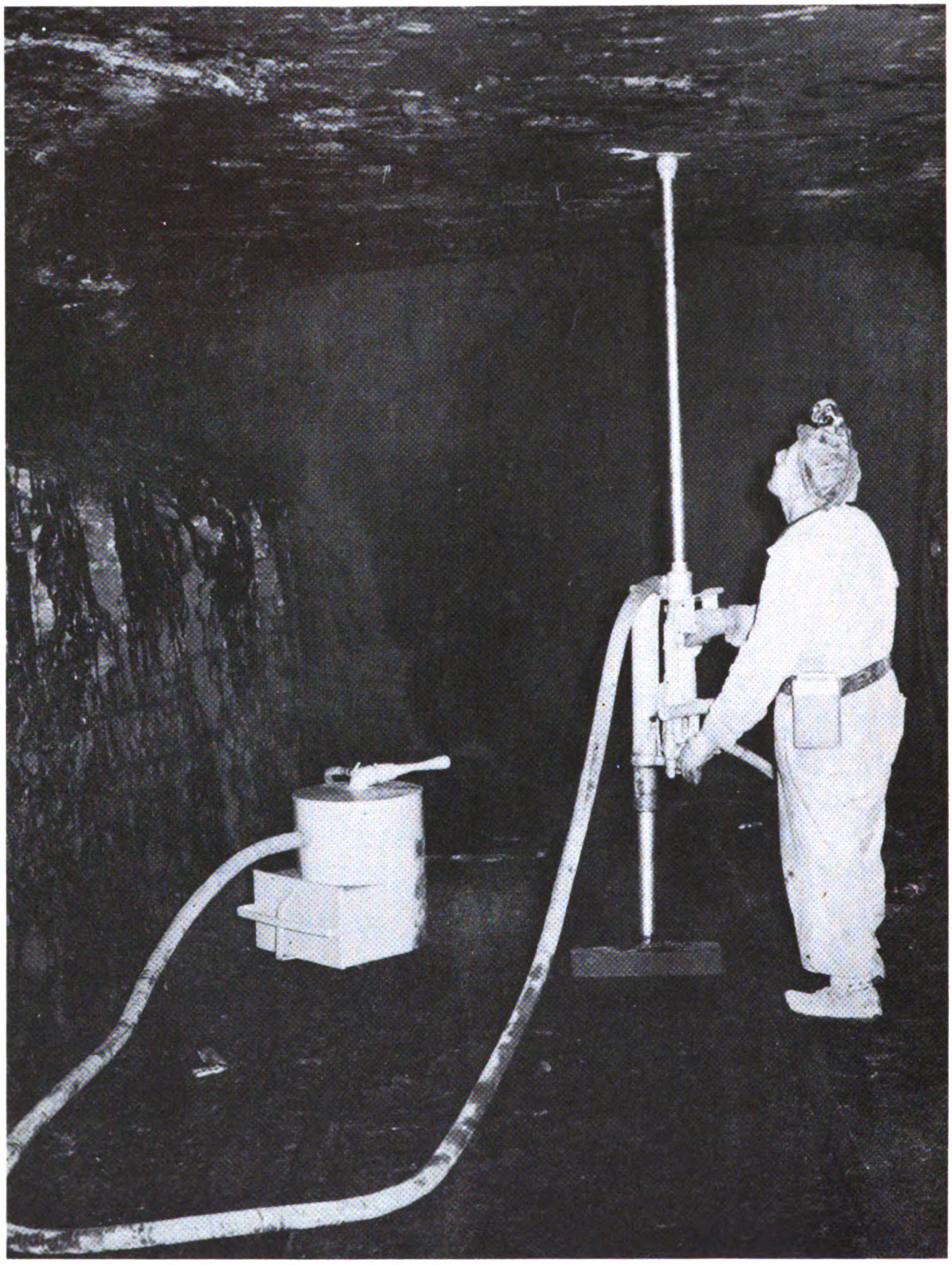

Figure 12. - Browning tank-type dust collector. BM-2532.

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25. Tram roof-control drill with hydro-slide attachment and integral dust-collecting system. - Approvals BM-2512 (for 250-volt, direct-current drill) and BM-2512A (for 550-volt, direct-current drill) issued to J. H. Fletcher & Co. June 16, 1953. Approved for roof drilling in coal mines when drilling is done vertically and through holes in steel shapes.

26. Model DAA7-C2-T1-R1 track-mounted roof-bolting and timbering machine with integral dust-collecting system. - Approval BM-2514 issued to J. H. Fletcher & Co. January 7, 1954. Approved for roof drilling in the following positions: (1) Vertically, (2) at an angle, and (3) through holes in steel shapes.

27. Bolt Hole Cleaner designed for attaching to Chicago Pneumatic Tool Co. RBD-30 roof-bolting drill. - Approval BM-2521 issued to Mine Safety Appliances Co. November 26, 1954. Approved for use with an RBD-30 roof-bolting drill.

28. Model DDA11-C2-R2 track-mounted roof-bolting machine with integral dust-collecting system. - Approval BM-2522A issued to J. H. Fletcher & Co. November 26, 1954. Approved for roof drilling in the following positions: (1) Vertically, (2) at an angle, and (3) through holes in steel shapes.

29. Model DAA13-C2-S2A1-R3 roof control drill with integral dust-collecting system. - Approval BM-2526 issued to J. H. Fletcher & Co. March 17, 1955. Approved for roof drilling in coal mines in the following positions: (1) Vertically, (2) at an angle, and (3) through holes in steel shapes.

30. Model RBD-15 roof-bolting drill with integral dust-collecting system. - Approvals BM-2528 (for 250-volt, direct-current drill) and BM-2528A (for 500-volt, direct-current drill) issued to Joy Manufacturing Co. April 29, 1955. Approved for roof drilling in coal mines.

31. Model RBD-15 roof-bolting drill with integral dust-collecting system. - Approvals BM-2529 (for 220-volt, alternating-current drill) and BM-2529 A (for 440-volt, alternating-current drill) issued to Joy Manufacturing Co. April 29, 1955. Approved for roof drilling in coal mines.

32. Drildust Bucket Collector. - Approval BM-2530 issued to Mine Safety Appliances Co. May 4, 1955. Approved for use in connection with rotary rock drilling in coal mines when roof holes are drilled vertically and at an angle to the vertical. Assembly with optional bucket and hood approved when roof holes are drilled vertically.

33. Model 56 RDR roof drill with integral dust-collecting system. - Approval BM-2533 issued to The Jeffrey Manufacturing Co. November 2, 1955. Approved for roof drilling in coal mines.

34. Model DFA7-C2-S4X-R2 roof control drill with integral dust-collecting system. - Approval BM-2534 issued to J. H. Fletcher & Co. October 11, 1955. Approved for roof drilling in coal mines.

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35. Double Tube Drildust Bucket Collector. - Approval BM-2535 issued to Mine Safety Appliances Co. October 11, 1955. Approved for use in connection with rotary rock drilling in coal mines when drilling is done upward.

36. Model DTF11-C2-S3X-R2 track-mounted roof-control drill with integral dust-collecting system. - Approval BM-2536A (for 550-volt, direct-current drill), issued to J. H. Fletcher & Co. October 24, 1955. Approved for roof drilling in coal mines.

37. Model DAF14-RH-C2-S2-R2 tram roof-control drill with integral dust-collecting system. - Approvals BM-2537 (for 220-volt, alternating-current drill) and BM-2537A (for 440-volt, alternating-current drill) issued to J. H. Fletcher & Co. December 2, 1955. Approved for roof drilling in coal mines.

38. Model RBD-11 roof-bolting drill with integral dust-collecting system. - Approval BM-2538 (for 220-volt, alternating-current drill) and BM-2538A (for 440- or 500-volt, alternating-current drill) issued to Joy Manufacturing Co. January 31, 1956. Approved for roof drilling in coal mines.

Typical dust collectors for rotary drilling are shown in figures 13 through 17.

NAMES AND ADDRESSES OF COMPANIES TO WHICH APPROVALS HAVE BEEN GRANTED

Browning Dust Collector Co., Box 133, Hampden, W. Va.

J. H. Fletcher & Co., Post Office Box 353, Huntington, W. Va., and 332 South Michigan Ave., Chicago, Ill.

Goodman Manufacturing Co., Halsted Street and 48th Place, Chicago, 9, Ill.

Ingersoll-Rand Co., Rock Drill Division, Phillipsburg, N. J.

The Jeffrey Manufacturing Co., Columbus 16, Ohio.

Joy Manufacturing Co., 54 Main Street, Claremont, N. H.

Mine Safety Appliances Co., 201 North Braddock Ave., Pittsburgh 8, Pa.

United Engineers Inc., Post Office Box 1188, Birmingham 1, Ala.

Westinghouse Air Brake Co., Cleveland Rock Drill Plant, LeRoi Div., 12500 Berea Road, Cleveland 11, Ohio

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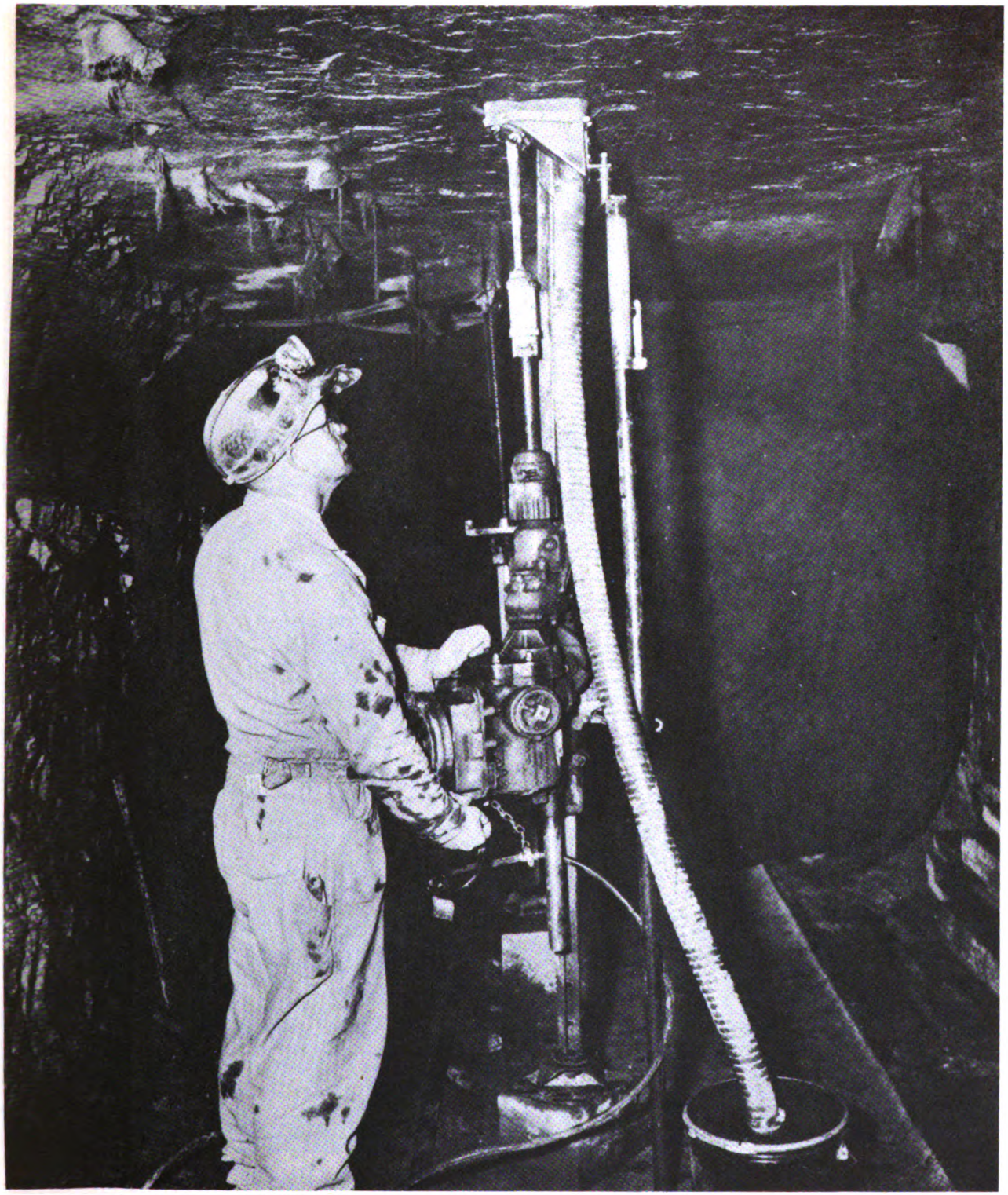

Figure 13. - No-Power dust trap. BM-2508.

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Figure 14. - Fletcher tram roof-control drill. BM-2509.

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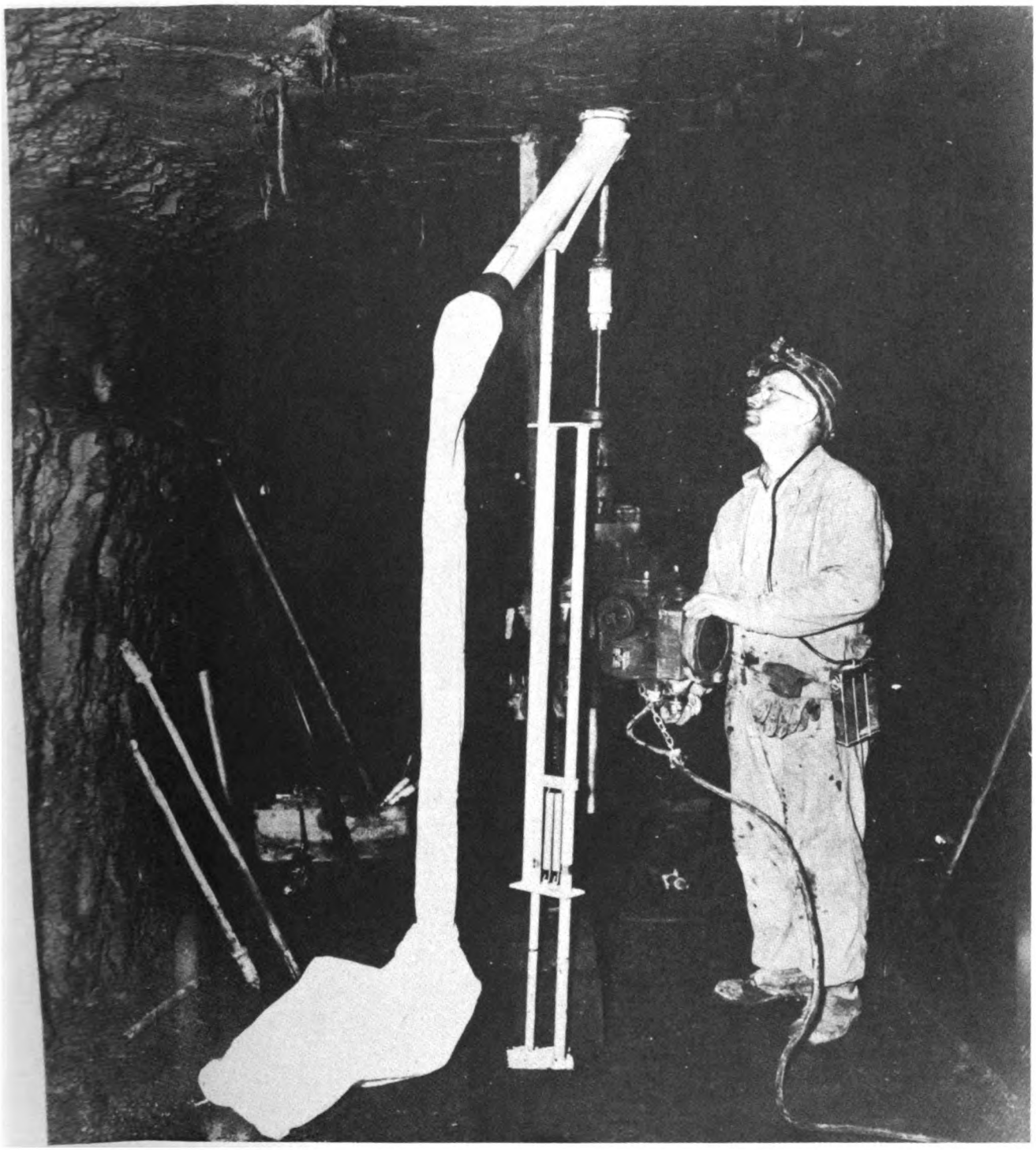

Figure 15. - Browning dust collector. BM-2510.

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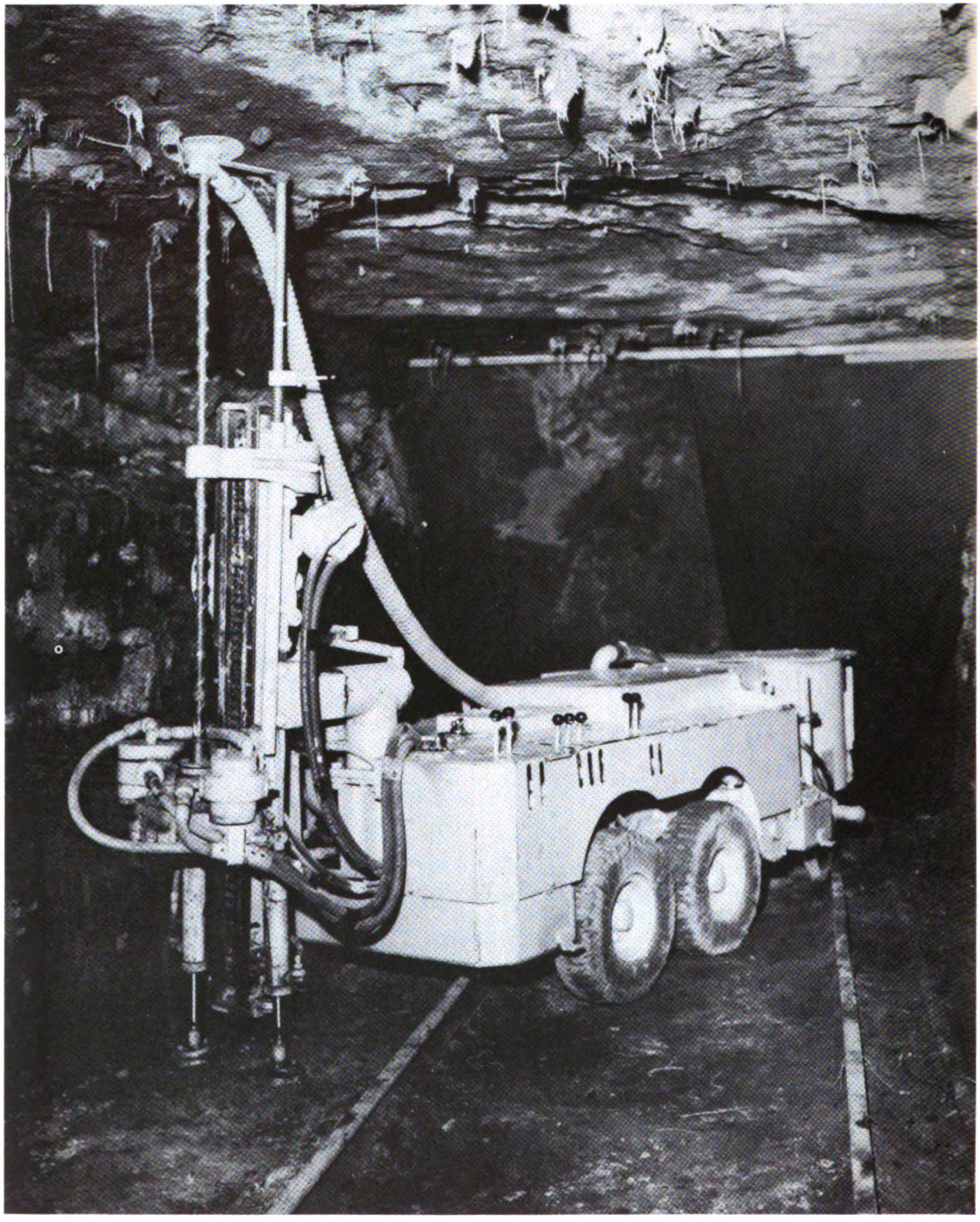

Figure 16. - Joy RBD-15 roof-bolting drill. BM-2528.

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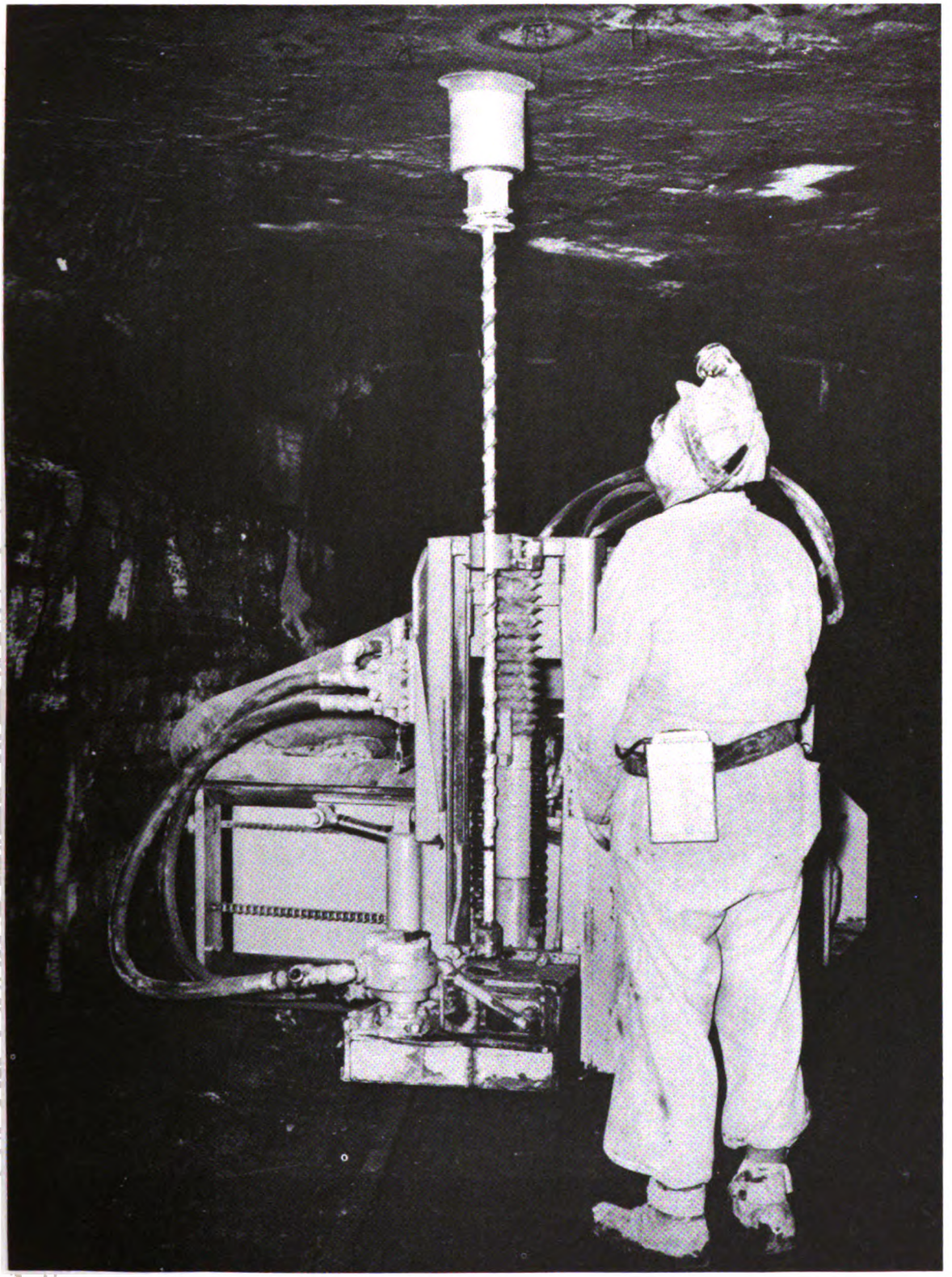

Figure 17. - M. S. A. Drildust bucket collector. BM-2530.

INT. - BU. OF MINES, PGH., PA. 7230

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